

What is claimed is:

[Claim 1] 1) (Previously amended) An image generating system, comprising:

- a) a light generating means for producing illumination light waves;
- b) an array of zone plate modulators for producing modulated light waves, said zone plate modulators comprising:
 - i) a pair of complementary Fresnel zone plates;
 - ii) a modulation means for changing the optical path difference between said pair of complementary Fresnel zone plates;

whereby said zone plate modulators cause diffractions of said illumination light waves incident thereon with the diffractions modulated by said modulation means, the diffracted portion of said illumination light waves incident upon each of said zone plate modulators is focused into a series of light spots along the axis of each of said zone plate modulators, and the diffracted portion of said illumination light waves incident upon said array of zone plate modulators form a first light spot array on the primary focal plane of said array of zone plate modulators;

c) an illumination means for causing said illumination light waves to be incident upon said array of zone plate modulators;

d) an electronic means for processing pattern data to be presented and for operating said array of zone plate modulators according to the pattern data; and

e) a first receiving surface for receiving said modulated light waves originating from said array of zone plate modulators.

[Claim 2] 2) (Previously amended) An image generating system of Claim 1, further comprising a magnifying lens means for providing an image, with a predetermined magnification, from said zone plate modulators onto said first receiving surface, wherein said magnifying lens means comprises lens elements of a type selected from the group of lens element types consisting of refractive lens elements, diffractive lens elements, and reflective focusing mirrors.

[Claim 3] 3) (Previously amended) An image generating system of Claim 2, further comprising a stopping means for blocking one of the diffracted portion and the undiffracted portion of said illumination light waves while allowing the other portion to propagate to said first receiving surface.

[Claim 4] 4) (Cancelled).

[Claim 5] 5) (Cancelled).

[Claim 6] 6) (Previously amended) An image generating system of Claim 1, wherein said first receiving surface is a projection screen, further comprising a magnifying lens means, whereby said modulated light waves form an image on said projection screen through said magnifying lens means for viewing by a viewer.

[Claim 7] 7) (Original) An image generating system of Claim 1, wherein said first receiving surface comprises a movable photoconductive printing medium which moves cooperatively with the operation of said array of zone plate modulators via said electronic means, and said modulated light waves form a latent image on said movable photoconductive printing medium.

[Claim 8] 8) (Original) An image generating system of Claim 1, wherein said first receiving surface comprises a movable optical recording medium which moves cooperatively with the operation of said array of zone plate modulators via said electronic means, and said modulated light waves are recorded as data bits arranged in tracks on said movable optical recording medium.

[Claim 9] 9) (Original) An image generating system of Claim 1, wherein said first receiving surface comprises a substrate and a movable stage for holding said substrate, wherein said substrate is layered with photosensitive material of which one or more characteristics are modified by said modulated light waves, and said movable stage is substantially parallel to and is movable coplanar in a first and a second dimensions, and in a third dimension substantially perpendicular to said first and second coplanar dimensions, said movable stage provides three dimensional alignment and positioning of said receiving surface in response to control signals.

[Claim 10] 10) (Cancelled).

[Claim 11] 11) (Cancelled).

[Claim 12] 12) (Cancelled).

[Claim 13] 13) (Original) An image generating system of Claim 1, wherein said zone plate modulators are zone plate modulators selected from the group consisting of reflective zone plate modulators and transmissive zone plate modulators.

[Claim 14] 14) (Cancelled).

[Claim 15] 15) (Cancelled).

[Claim 16] 16) (Cancelled).

[Claim 17] 17) (Previously amended) A direct viewing system, comprising:

- a) a light generating means for producing illumination light waves;
- b) an array of zone plate modulators for producing modulated light waves, said zone plate modulators comprising:
 - i) a pair of complementary Fresnel zone plates;
 - ii) a modulation means for changing the optical path difference between said pair of complementary Fresnel zone plates;

whereby said zone plate modulators cause diffractions of said illumination light waves incident thereon with the diffractions modulated by said modulation means, the diffracted portion of said illumination light waves incident upon each of said zone plate modulators is focused into a series of light spots along the axis of each of said zone plate modulators, and the diffracted portion of said illumination light waves incident upon said array of zone plate modulators form a first light spot array on the primary focal plane of said array of zone plate modulators;

- c) an illumination means for causing said illumination light waves to be incident upon said array of zone plate modulators;

- d) an electronic means for processing pattern data to be presented and for operating said array of zone plate modulators according to the pattern data; and
- e) a magnifying lens means for providing a virtual image using said modulated light waves with a predetermined magnification, said virtual image being viewable by a viewer through said magnifying lens means.

[Claim 18] 18) (Cancelled).

[Claim 19] 19) (Currently amended) A direct viewing system of Claim 17, further comprising a stopping means for blocking one of the diffracted portion and the undiffracted portion of said illumination light waves while allowing the other portion to pass through.

[Claim 20] 20) (Cancelled).

[Claim 21] 21) (Cancelled).

[Claim 22] 22) (Original) A direct viewing system of Claim 17, wherein said array of zone plate modulators is a two-dimensional array of zone plate modulators.

[Claim 23] 23) (Cancelled).

[Claim 24] 24) (Original) A direct viewing system of Claim 17, wherein said zone plate modulators are zone plate modulators selected from the group consisting of reflective zone plate modulators and transmissive zone plate modulators.

[Claim 25] 25) (Cancelled).

[Claim 26] 26) (Cancelled).

[Claim 27] 27) (Previously amended) A maskless lithography system, comprising:
a) a wave source producing illumination waves;

b) an array of zone plate modulators for producing modulated waves, said zone plate modulators comprising:

i) a pair of complementary Fresnel zone plates;

ii) a modulation means for changing the wave path difference between said pair of complementary Fresnel zone plates;

whereby said zone plate modulators cause diffractions of said illumination waves incident thereon with the diffractions modulated by said modulation means, the diffracted portion of said illumination waves incident upon each of said zone plate modulators is focused into a series of wave spots along the axis of each of said zone plate modulators, and the diffracted portion of said illumination waves incident upon said array of zone plate modulators form a first wave spot array on the primary focal plane of said array of zone plate modulators;

c) an illumination means for causing said illumination waves to be incident upon said array of zone plate modulators;

d) an electronic means for processing pattern data to be presented and for operating said array of zone plate modulators according to the pattern data; and

e) a first receiving surface for receiving said modulated waves originating from said array of zone plate modulators.

[Claim 28] 28) (Original) A maskless lithography system of Claim 27, wherein said illumination waves are a type of waves selected from the group consisting of electromagnetic waves and matter waves.

[Claim 29] 29) (Original) A maskless lithography system of Claim 27, wherein said first receiving surface comprises wave sensitive materials of which one or more characteristics are modified by said modulated waves.

[Claim 30] 30) (Previously amended) A maskless lithography system of Claim 27, further comprising a magnifying lens means for providing an image, with a predetermined magnification, from said zone plate modulators onto said first receiving surface, wherein said magnifying lens means comprises lens elements of a type selected from the group of lens element types consisting of refractive lens elements, diffractive lens elements, and reflective focusing mirrors.

[Claim 31] 31) (Previously amended) A maskless lithography system of Claim 30, further comprising a stopping means for blocking one of the diffracted portion and the undiffracted portion of said illumination waves while allowing the other portion to propagate to said first receiving surface.

[Claim 32] 32) (Cancelled).

[Claim 33] 33) (Cancelled).

[Claim 34] 34) (Cancelled).

[Claim 35] 35) (Cancelled).

[Claim 36] 36) (Original) A maskless lithography system of Claim 27, wherein said first receiving surface comprises a photo-charged particle converter for converting said first wave spot array into a plurality of charged particle beams, further comprising a second receiving surface and a focusing-scanning means, said second receiving surface being layered with charged particle beam sensitive materials for receiving said charged particle beams, said focusing-scanning means focusing said charged particle beams, that originate from said photon-charged particle converter, onto said second receiving surface, and said focusing-scanning means scanning said charged particle beams coplanar in a first and a second dimensions substantially parallel to said second receiving surface.

[Claim 37] 37) (Original) A maskless lithography system of Claim 27, wherein said first receiving surface is a photo-photon converter for converting said first wave spot array into an array of electromagnetic waves having different wavelength.

[Claim 38] 38) (Cancelled).

[Claim 39] 39) (Original) A maskless lithography system of Claim 27, wherein said array of zone plate modulators is a two-dimensional array of zone plate modulators.

[Claim 40] 40) (Original) A maskless lithography system of Claim 27, wherein said array of zone plate modulators is an array of zone plate modulators selected from the group consisting of one-dimensional array of zone plate modulators and a staggered two-dimensional array of zone plate modulators, further comprising a second scanning means, whereby said array of zone plate modulators generates a substantially linear image, and said second scanning means scans the linear image in a direction substantially normal to the linear image to generate a two-dimensional image.

[Claim 41] 41) (Cancelled).

[Claim 42] 42) (Original) A maskless lithography system of Claim 27, wherein said zone plate modulators are zone plate modulators selected from the group consisting of reflective zone plate modulators and transmissive zone plate modulators.

[Claim 43] 43) (Cancelled).

[Claim 44] 44) (Cancelled).

[Claim 45] 45) (Previously amended) A method for generating patterns, comprising:

a) generating illumination waves;

b) providing an array of zone plate modulators for producing modulated waves, said zone plate modulators comprising:

i) a pair of complementary Fresnel zone plates;

ii) a modulation means for changing the wave path difference between said pair of complementary Fresnel zone plates;

whereby said zone plate modulators cause diffractions of said illumination waves incident thereon with the diffractions modulated by said modulation means, the diffracted portion of said illumination waves incident upon each of said zone plate modulators is focused into a series of wave spots along the axis of each of said zone plate modulators, and the diffracted portion of said illumination waves incident upon said array of zone plate modulators form a first wave spot array on the primary focal plane of said array of zone plate modulators;

(c) directing said illumination waves to incident upon said array of zone plate modulators;

(d) processing pattern data to be presented electronically;

(e) operating said array of zone plate modulators electronically according to the pattern data; and

(f) receiving said modulated waves originating from said array of zone plate modulators.

[Claim 46] 46) (Original) A method of Claim 45, further comprising separating the undiffracted portion of said illumination waves from the diffracted portion of said illumination waves by blocking one of the diffracted and the undiffracted waves while allowing the other to be received.

[Claim 47] 47) (Cancelled).

[Claim 48] 48) (Original) A method of Claim 45, further comprising providing an image of said first wave spot array on the primary focal plane of said array of zone plate modulators, wherein said image is a second wave spot array.

[Claim 49] 49) (Original) A method of Claim 48, further comprising scanning the wave spots of said second wave spot array to fill in the spaces around the wave spots of said second wave spot array along a first and a second coplanar dimensions.

[Claim 50] 50) (Cancelled).

[Claim 51] 51) (Original) A method of Claim 45, wherein said array of zone plate modulators in step (b) is an array of zone plate modulators selected from the group consisting of reflective zone plate modulators and transmissive zone plate modulators.

[Claim 52] 52) (Cancelled).

[Claim 53] 53) (Original) A method of Claim 45, wherein said array of zone plate modulators in step (b) comprises an array of zone plate modulators selected from the

group consisting of one-dimensional array of zone plate modulators and a staggered two-dimensional array of zone plate modulators for generating substantially linear images, further comprising scanning said linear images in a direction substantially normal to said linear images to form a two-dimensional image.

[Claim 54] 54) (Original) A method of Claim 45, further comprising converting said modulated light waves originating from said array of zone plate modulators into a second array of waves of a type selected from the group consisting of charged particle beams and electromagnetic waves.

[Claim 55] 55) (Cancelled).

[Claim 56] 56) (Cancelled).